

AMENDMENT

In the Claims:

Please amend claims 1-3 and 10 as per attached with this response and amendment. Attachment A contains a marked-up copy of the claim amendments, while Attachment B contains a clean copy of the amended claims.

REMARKS

Upon entry of this amendment, claims 1-3 and 10 are pending in the application. Claim 1 is an independent claim drawn to an apparatus for processing heavy hydrocarbon feed, and the remaining claims depend therefrom. Claims 1-3 and 10 have been amended to further clarify what the Applicant considers to be the invention and to clarify the distinctions between the inventive subject matter and the prior art references. Applicant further submits that the amendments to the claims do not add new matter within the meaning of 35 U.S.C. §132.

The amendment filed on October 31, 2001 is objected to as introducing new matter into the claims. However, Applicant has amended the claims to remove the phrase which the Examiner finds objectionable. Claims 1-3 and 10 stand rejected as being obvious over the van Klinken et al. patent (U.S. Patent No. 4,039,429).

1. Objection to the Previous Amendment

The Examiner objects to the previously filed amendment as introducing new matter into the claims by the addition of the word "only" to line 19 of claim 1. Applicant has amended claim 19 to remove the term from the claim, thus removing the basis for this objection. Accordingly, Applicant respectfully requests reconsideration and withdrawal of the objection to the claims.

2. Rejection of Claims 3 and 10 Under 35 U.S.C. 103(a)

Claims 1-3 and 10 stand rejected under 35 U.S.C. 103(a) as being obvious over van Klinken et al. (U.S. Patent No. 4,039,429). As a basis for the rejection, the Office Action states:

With regard to claim 1, van Klinken discloses a heater for heating the heavy hydrocarbons and an atmospheric fractionating tower for fractionating the heated heavy hydrocarbon feed. Van Klinken calls this combination a "First Atmospheric Distilling Zone (Figure 1(2)). Since a still contains both a heat source and a fractionating tower, van Klinken's description "atmospheric distilling zone" is equivalent to the heater and an atmospheric fractionating tower of the present invention.

Van Klinken discloses a further heater and a vacuum fractionating tower ("First Vacuum Distilling Zone" Figure 1 (3)).

Van Klinken discloses a solvent deasphalting (SDA) unit (Figure 1 (4)).

Van Klinken discloses a thermal cracker (cracker (10) operates at 450°C to 525°C, column 3 line 50, and thus is thermal as well as catalytic).

Van Klinken discloses a thermal cracker (10) for cracking the deasphalted oil,

Van Klinken fails expressly to disclose a further cracker

for thermally cracking the light vacuum fractions. Since van Klinken discloses thermally cracking the light vacuum fractions in a cracker (10), as well as cracking the deasphalted oil in a cracker (10) at the time of the invention it would have been obvious to one skilled in the art to use two crackers instead of one. This would be an obvious modification, since it has been held that mere duplication of parts has no patentable significance unless new and unexpected results are produced. In re Harza, 124 U.S.P.Q. 378 (C.C.P.A. 1960).

While van Klinden fails expressly to disclose that the cracked light vacuum fraction is recycled to the inlet of the atmospheric fractionating tower, since one of the outputs of the apparatus of van Klinken (43) is considered residue (column 7 line 43) and since the apparatus of van Klinken used residue as its input stream (Abstract), it would have been obvious to recycle the output (43) to the inlet (13) of the system. The motivation would have been to convert a residue stream to a light distillate (Abstract).

With regard to claim 2, van Klinken discloses means (21) for supplying only the heavy portion of the light vacuum fraction to the thermal cracker.

With regard to claims 3 and 10, the apparatus of van Klinken includes essentially the same apparatus as the present claim, including a hydrotreater (9), a heater and atmospheric fractionating unit (Figure 1 (11), the distilling zone includes a heater and fractionating tower) but fails expressly to disclose an additional vacuum fractionating apparatus.

Van Klinken discloses an atmospheric fractionating tower (2) followed by a vacuum fractionating tower (3). At the time of the invention it would have been obvious to one skilled in the art to follow the atmospheric fractionating tower (Figure 1 (11)) with a vacuum fractionating tower as was done with the upstream atmospheric fractionating tower (Figure 1 (2)).

The motivation would have been to further separate the process stream into fractions, just as was done upstream by the atmospheric fractionating tower (2) and the vacuum fractionating tower (3).

RESPONSE

Applicant respectfully traverses this rejection and requests reconsideration and withdrawal thereof.

The reference of record, van Klinken et al., does not teach or suggest applicants' inventive subject matter as a whole, as recited in the amended claims. Further, there is no teaching or suggestion in this reference which would lead the ordinary skilled artisan to modify the reference to derive the subject matter as defined in the amended claims.

The U.S. Supreme Court in *Graham v. John Deere Co.*, 148 U.S.P.Q. 459 (1966) held that non-obviousness was determined under § 103 by (1) determining the scope and content of the prior art; (2) ascertaining the differences between the prior art and the claims at issue; (3) resolving the level of ordinary skill in the art; and, (4) inquiring as to any objective evidence of nonobviousness.

A. The Present Inventive Subject Matter

As amended, claim 1 is drawn to Apparatus of processing heavy hydrocarbon feed comprising: a heater for heating said heavy hydrocarbon feed; an atmospheric fractionating tower for fractionating the heated heavy hydrocarbon feed fed to the inlet of the atmospheric fractionating tower producing light atmospheric fractions and atmospheric bottoms; a further heater for heating

said atmospheric bottoms and producing heated atmospheric bottoms; a vacuum fractionating tower for fractionating said heated atmospheric bottoms and producing light vacuum fractions and vacuum residue; a solvent deasphalting (SDA) unit for producing deasphalted oil (DAO) and asphaltenes from said vacuum residue; a deasphalted oil thermal cracker for thermally cracking said deasphalted oil (DAO) and producing thermally cracked deasphalted oil, the outlet of said deasphalted oil thermal cracker being connected to an inlet of said atmospheric fractionating tower so that said thermall cracked deasphalted oil is recycled to the inlet of said atmospheric fractionating tower; and a light vacuum fraction thermal cracker for thermally cracking said light vacuum fractions for producing thermally cracked light vacuum fractions, the outlet of said light vacuum fraction thermal cracker being connected to an inlet of said atmospheric fractionating tower so that said thermally cracked light vacuum fractions is recycled to the inlet of said atmospheric fractionating tower.

The remaining claims depend from claim 1 and therefore contain all of the limitations found in claim 1. Therefore, if claim 1 is not obvious over the reference, the remaining claims are likewise not obvious over the reference.

B. The Prior Art

In contrast, van Klinken (U.S. Patent No. 4039,429) discloses a combination of processes that are designed to convert atmospheric reduced crude to light products through conversion by Fluid Catalytic Cracking (FCC). Van Klinken discloses several combinations of vacuum distillation, visbreaking, deasphalting and FCC to obtain light products.

**C. Differences between the Claimed Subject Matter
and the Prior Art**

The differences between applicant's inventive subject matter and the cited reference are readily apparent from their independent and distinct disclosures. The differences between the presently claimed subject matter and van Klinken are not merely directed to the use of a thermal cracker (present claims) versus a catalytic cracker (van Klinken). The present inventive subject matter involves two different thermal crackers: a deasphalted oil thermal cracker and a light vacuum fractions thermal cracker. Claim 1 has been amended to emphasize the use of the two different thermal crackers. These thermal crackers are separate entities and have their own, individual operating characteristics. It is important that the two thermal crackers be separate with their own operating

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parameters, as will become more clear later in this discussion regarding the differences between the present claims and van Klinken.

In addition, the present invention teaches, as a whole, that the recycle of the thermally cracked DAO and the thermally cracked light vacuum fractions will bring about an improvement in the quality of the products produced. This is due to the fact that more asphaltenes will be separated by the use of the apparatus of the present inventive subject matter. The separation of more asphaltenes leads to higher-quality end products from the use of the apparatus. This is in addition to the fact that the crackers are thermal crackers and not catalytic crackers, as is required in the van Klinken patent. For this reason, Applicant respectfully submits that the use of a DAO thermal cracker and a light vacuum fraction thermal cracker cannot be taught by van Klinken since any asphaltenes present in the DAO or light vacuum fractions would foul any catalyst used in the catalytic cracking process of van Klinken. The use of separate thermal crackers for the DAO and the light vacuum fractions, with their own operating parameters and characteristics, minimizes the fouling by asphaltenes in the individual thermal crackers. This is especially true in the light vacuum fractions thermal cracker.

recycle
the cracker

Applicant would like to acknowledge that van Klinken discloses

thermally cracking the bottom, asphaltene-containing stream 24 in thermal cracking zone 5 (see fig. 1 and the accompanying description in column 6, line 65 to column 7, line 43, and in particular, column 7 lines 2-3 and 16-21). Applicant respectfully submits that such a process will produce more asphaltenes in thermally cracked product 25 that will contaminate second atmospheric distilling zone 6 and second vacuum distilling zone 7 and their products. In other embodiments of van Klinken, the thermal crackeing of the asphalt is replaced by coking which also produces further asphaltenes. On the other hand, in the present claims, no thermal cracking or coking of the asphaltene stream is disclosed or claimed. Instead, DAO and the light (with respect to claim 1) or heavy (with respect to claim 2) portion of the vacuum fractions is thermally cracked.

Further, Applicant respectfully submits that there is no disclosure in van Klinken of recycling the thermally cracked DAO to the atmospheric fractionating tower, as has been made clear with the amendments to claim 1. Likewise, van Klinken is silent with respect to the recycling of the thermally cracked lighter vacuum fractions to the atmospheric fractionating tower, as is also made clear in amended claim 1. In addition, claim 10 has been amended to claim that the hydrotreater also processes the lighter portion of the light atmospheric fractions and produces the hydrotreated hydrocarbon feed, which is not disclosed in van Klinken.

Furthermore, Applicants respectfully reiterate that van Klinken fails to disclose the arrangement of the elements of the claim and the two distinct thermal crackers, with the thermally cracked products from each distinct thermal cracker being recycled to the initial atmospheric distillation column. The Examiner argues that it would have been obvious to modify van Klinken in an effort to obtain the presently claimed invention, however, even if van Klinken were modified as indicated by the Examiner, the result would still not achieve the presently claimed subject matter because van Klinken does not disclose the separate and distinct thermal crackers, as is discussed above. Such an omission would render the van Klinken patent different from the present claims, and thus there would be no motivation to alter van Klinken to attempt to achieve the present inventive subject matter.

Applicants respectfully request reconsideration and withdrawal of the rejection of claims 1-3 and 10 as being obvious over van Klinken et al.

CONCLUSION

In view of the foregoing, applicants respectfully request the Examiner to reconsider and withdraw the all pending rejections, and to allow all of the claims pending in this application.

If the Examiner has any questions or comments regarding this

Attorney Dkt. No. P-15149
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matter, he is welcomed to contact the undersigned attorney at the
below-listed number and address.

Respectfully submitted,

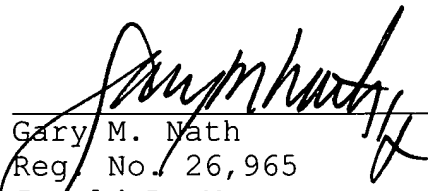
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Serial No.: 09/431,159

Group Art Unit: 1764

Filed: November 1, 1999

Examiner: R. Varcoe Jr.

For:

**METHOD OF AND APPARATUS FOR PROCESSING HEAVY
HYDROCARBON FEEDS**

ATTACHMENT A - MARKED-UP COPY OF CLAIM AMENDMENTS

Please amend claims 1-3 and 10 as follows:

1. (Twice Amended) Apparatus of processing heavy hydrocarbon feed comprising:

a) a heater for heating said heavy hydrocarbon feed;
b) an atmospheric fractionating tower for fractionating the heated heavy hydrocarbon feed fed to the inlet of the atmospheric fractionating tower producing light atmospheric fractions and atmospheric bottoms;

c) a further heater for heating said atmospheric bottoms and producing heated atmospheric bottoms;

d) a vacuum fractionating tower for fractionating said heated atmospheric bottoms and producing light vacuum fractions and vacuum residue;

e) a solvent deasphalting (SDA) unit for producing deasphalted oil (DAO) and asphaltenes from said vacuum residue;

f) a deasphalted oil thermal cracker for thermally cracking said deasphalted oil (DAO) and producing [a] thermally cracked [product which] deasphalted oil, (the outlet of said deasphalted oil thermal cracker being connected to an inlet of said atmospheric fractionating tower so that said thermally cracked deasphalted oil is recycled to the inlet of [of] said atmospheric fractionating tower; and

g) a [further] light vacuum fraction thermal cracker for [only] thermally cracking said light vacuum fractions for producing [a further] thermally cracked light vacuum fractions [product which], (the outlet of said light vacuum fraction thermal cracker being connected to an inlet of said atmospheric



fractionating tower so that said thermally cracked light vacuum fractions is recycled to the inlet of said atmospheric fractionating tower.

2. (Amended) Apparatus according to claim 1 including means for supplying only the heavy portion of said light vacuum fractions to said [further] light vacuum fraction thermal cracker.

3. (Amended) Apparatus according to claim 2 including a hydrogen donor system for processing the lighter portion of said light vacuum fractions and producing a hydrogen donor stream, said hydrogen donor system including:

a) a hydrotreater for producing a [treated] hydrotreated hydrocarbon feed from said [the] lighter portion of said light vacuum fractions;

b) a still further heater for producing a heated, [treated] hydrotreated hydrocarbon stream from said hydrotreated hydrocarbon feed;

c) a further atmospheric fractionating tower for fractionating said heated [treated] hydrotreated hydrocarbon stream for producing further light atmospheric fractions products and [further] hydrotreated atmospheric bottoms;

d) an additional heater for heating said further atmospheric bottoms and producing heated, further atmospheric bottoms; and

e) a further vacuum fractionating tower for fractionating said heated, [further] hydrotreated atmospheric bottoms and producing [further] hydrotreated lighter vacuum fractions products and further vacuum residue, an outlet of said further vacuum fractionating tower containing the heavier portion of said hydrotreated lighter vacuum fractions products or hydrogen donor stream being connected to the inlet of said deasphalted oil thermal cracker such that the heavier portion of said [further] hydrotreated lighter vacuum fractions products or

hydrogen donor stream is supplied to said deasphalted oil thermal cracker.

10. (Twice Amended) Apparatus according to claim 3 wherein said hydrotreater also processes the lighter portion of said light atmospheric fractions and produces said hydrotreated hydrocarbon feed [1 including:

a) a hydrotreater for processing the lighter portion of said light vacuum fractions and producing a treated, hydrocarbon stream;

b) a still further heater for heating said treated, hydrocarbon stream for producing a heated, treated, hydrocarbon stream

c) a still further atmospheric fractionating column for producing from said heated, hydrocarbon stream further light atmospheric fractions and further atmospheric bottoms;

d) an even further heater for heating said further atmospheric bottoms producing heated, further atmospheric bottoms; and

e) a still further vacuum fractionating column for producing further lighter vacuum fractions and further vacuum residue such that the heavier portion of said further light vacuum fractions is supplied together with said deasphalted oil to said thermal cracker.]

Serial No.: 09/431,159

Group Art Unit: 1764

Filed: November 1, 1999

Examiner: R. Varcoe Jr.

For:

**METHOD OF AND APPARATUS FOR PROCESSING HEAVY
HYDROCARBON FEEDS**

ATTACHMENT B - CLEAN COPY OF AMENDED CLAIMS

Please amend claims 1-3 and 10 as follows:

1. (Twice Amended) Apparatus of processing heavy hydrocarbon feed comprising:

- a) a heater for heating said heavy hydrocarbon feed;
- b) an atmospheric fractionating tower for fractionating

5 the heated heavy hydrocarbon feed fed to the inlet of the atmospheric fractionating tower producing light atmospheric fractions and atmospheric bottoms;

c) a further heater for heating said atmospheric bottoms and producing heated atmospheric bottoms;

10 d) a vacuum fractionating tower for fractionating said heated atmospheric bottoms and producing light vacuum fractions and vacuum residue;

e) a solvent deasphalting (SDA) unit for producing deasphalted oil (DAO) and asphaltenes from said vacuum residue;

5 f) a deasphalted oil thermal cracker for thermally cracking said deasphalted oil (DAO) and producing thermally cracked deasphalted oil, the outlet of said deasphalted oil thermal cracker being connected to an inlet of said atmospheric fractionating tower so that said thermally cracked deasphalted oil is recycled to the inlet of said atmospheric fractionating tower; and

g) a light vacuum fraction thermal cracker for thermally cracking said light vacuum fractions for producing thermally cracked light vacuum fractions, the outlet of said light vacuum fraction thermal cracker being connected to an inlet of said atmospheric fractionating tower so that said thermally



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F cracked light vacuum fractions is recycled to the inlet of said atmospheric fractionating tower.

Del 2. (Amended) Apparatus according to claim 1 including means for supplying only the heavy portion of said light vacuum fractions to said light vacuum fraction thermal cracker.

3. (Amended) Apparatus according to claim 2 including a hydrogen donor system for processing the lighter portion of said light vacuum fractions and producing a hydrogen donor stream, said hydrogen donor system including:

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DT a) a hydrotreater for producing a hydrotreated hydrocarbon feed from said lighter portion of said light vacuum fractions;

b) a still further heater for producing a heated, hydrotreated hydrocarbon stream from said hydrotreated hydrocarbon feed; *F*

c) a further atmospheric fractionating tower for fractionating said heated hydrotreated hydrocarbon stream for producing further light atmospheric fractions products and hydrotreated atmospheric bottoms;

d) an additional heater for heating said further atmospheric bottoms and producing heated, further atmospheric bottoms; and

e) a further vacuum fractionating tower for fractionating said heated, hydrotreated atmospheric bottoms and producing hydrotreated lighter vacuum fractions products and further vacuum residue, an outlet of said further vacuum fractionating tower containing the heavier portion of said hydrotreated lighter vacuum fractions products or hydrogen donor stream being connected to the inlet of said deasphalted oil thermal cracker such that the heavier portion of said hydrotreated lighter vacuum fractions products or hydrogen donor stream is supplied to said deasphalted oil thermal cracker.

DT 10. (Twice Amended) Apparatus according to claim 3 wherein *F*

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said hydrotreater also processes the lighter portion of said
light atmospheric fractions and produces said hydrotreated
hydrocarbon feed.
